

ART. XXII.—*Some New and Unrecorded Endoparasites  
from Australian Chickens.*

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(With Plates XXXI.—XXXV.)

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Some time ago Professor Gilruth, as Director of the Veterinary Research Institute of the Melbourne University, handed me a small phial containing "tapeworms from fowls," with a request for their identification and report. Since then I have collected endoparasites from a number of chickens from Victoria. The following contains the results of these observations, together with the record of two forms sent from Queensland fowls by Dr. Sydney Dodd, Chief Veterinarian and Bacteriologist, Brisbane, and of one from Dr. H. Cumpston, Chief Health Officer, Perth, West Australia.

CESTODA.

*Choanotaenia infundibulum* (Bloch, 1779), Cohn, 1899.

This cestode appears fairly common in the suburbs of Melbourne, and has not been previously definitely recorded from any part of Australia.

My specimens of this species show in over 60 per cent. of cases a somewhat smaller diameter of the head, viz., .33 mm., and sometimes even less (.31 mm.) instead of the normal .4 mm. The head seems always conical. The suckers are generally .17 to .22 mm. long, and .068 mm. in transverse diameter; the rostellum has a rather greater width than usual, viz., .08 to .1 mm., while the hooks it carries vary in number from 11 to 22, have the characteristic shape, and are .024 to .03 mm. long.

*Davainea cesticillus* (Molin, 1858), Blanchard, 1891.

This cestode of fowls has been previously recorded for Australia, only from New South Wales, by Mr. T. H. Johnston

(1909, p. 590). My specimens are all from the suburbs of Melbourne.

*Davainea tetragona* (Molin, 1858), Blanchard, 1891.

This cestode also has only been previously recorded for Australia by Mr. Johnston (loc. cit.) from New South Wales. My specimens were sent by Dr. Dodd from Rockhampton, Queensland. I have not, so far, been able to obtain any specimens from Victorian chickens.

*Davainea varians* (sp.n.) (Pls. XXXI.-XXXIII. Figs. 1-13).

This new species I have so far only found amongst those handed to me by Professor Gilruth, from one of the outer eastern suburbs of Melbourne. At first glance it will almost certainly be identified with *Davainea proglottina*, and it is only on close examination of the head with its rostellum and suckers—the characters of which are often extremely difficult to see—and also of sections of the body, that one is convinced that this cannot be that species. In different respects it suggests a combination of some features of *D. proglottina* with others of *D. echinobothrida*.

The specific name has been given in reference to the great variability in the conformation of the strobila, some of the variations in which are given herewith (Figs. 3 to 7), as drawn with the camera lucida.

*Description*.—Strobila .7 to 1.8 mm. long by .33 to .68 mm. broad. Head club-shaped to globular or spherical, .07 mm. to .155 or even .217 mm. long by .1 to .19 mm. broad. The neck, which is often hardly present at all, may be up to .092 mm. long, and from .059 to .11 mm. wide (only rarely the former). The retractile rostellum is broad and much depressed; its antero-posterior diameter varies from .009 and .016 (completely everted) to .026 mm., and its lateral diameter .044 (and once .033) mm. to .075 mm. The middle region of the fully everted rostellum carries a row of hooks .0075 to .009 mm. long. These hooks, 44 to 50 in number, though not varying much in length, are arranged in an alternating manner (as shown in Fig. 1). The shaft or prong is bar-like, nearly straight, in the middle two-thirds, but when seen in face view cuneate or broadly wedge-

shaped at the tip, and in side view bent dorsally. The dorsal root is short, the ventral long, curved and pointed (contrast the rostellar hooks of *D. proglottina*). The suckers are circular, .033 to .046 mm. in diam. (rarely the latter), and are armed with 4 or 5 (or rarely 6) rows of thorn-like hooks, .005 in length, with a more or less clearly bilobed base, formed by the two roots, which are almost equal in length. These hooks become very easily detached from the suckers (as shown in Fig. 1). The strobila has in addition to the head from 4 to 6 segments, the shape of which varies greatly. The first may be only .045 mm. long, and the last may be .29 mm. (in a strobila of .7 mm. length) to .79 mm. (in a strobila of 1.32 mm. length). The shape of each individual segment being much wider than long (e.g., in the proportion of 4 or 6 to 1), may be such that the whole strobila is like a low cone with a rounded base; or, all the segments except the youngest, from being equal in length and breadth, may become at the posterior end  $1\frac{1}{2}$  to  $2\frac{1}{2}$  times as long as they are wide. The head becomes very easily detached from the first segment, and that from the second segment. Genital pores are alternate, and situated at or near the anterior angle, sometimes on a low papilla. The stage of development reached by the female genitalia in relation to that of the male in the individual segments varies in different individual strobilae. Thus in some cases a condition somewhat similar to that found in *D. proglottina* is to be seen, i.e., the last segment contains only the eggs with the oncospheres. The next younger segment contains well-developed female organs, often with fully-formed eggs, and the more or less atrophied male organs, while in the next younger segment still, the female reproductive organs are somewhat more developed than in the corresponding segment in *D. proglottina*. Two variations from this condition are found. In the one the male organs appear to be functional as far back as the fifth or last segment (e.g., Fig. 8), the female organs being much less developed than in corresponding segments of other strobilae. In the other variation hardly any sign even of atrophied male organs can be seen in any of the segments, the eggs being well developed as far forward as the third segment. Evidently there is a considerable difference in the degree of proterandry shown in different individual strobilae.

The cirrus pouch is more globular than in *D. proglottina*, and the contained cirrus, which is armed with spines, may be extruded to a length of .148 mm. from the body. The eggs are more or less isolated, the parent parenchyma being arranged so as to form thin fibrous capsules with a membrane enclosing the eggs singly or in groups of two to (rarely) thirteen; the ova are .018 to .020 mm. in diameter. Egg-capsules containing two ova may be .0325 to .050 mm. in extreme length. Hooks of the oncosphere .006 to .008 mm. long.

The histological details of these specimens were extremely hard to make out, owing in great measure to the number of large yellowish concretions up to .012 mm. by .0078 mm. in size. The cuticle is .004 to .006 mm. in thickness.

The life-history is unknown.

The variations met with in the general shape of the strobila, and in the relative stage of development reached by the two sets of reproductive organs, in the individual segments, suggest the possibility of there being two species represented in this material, but I have been unable to detect any differences of specific value, and hence can only regard this as a very variable form, probably undergoing evolutionary development from the Northern Hemisphere form, *D. proglottina*, into one or two more new species.

With regard to the condition of the hosts, I have received the following note from Professor Gilruth:—"The parasites were found in two chickens, each a few months old, which were received at the laboratory for examination, from the suburbs of Melbourne. One was a pure Orpington, the other a Plymouth Rock. Both fowls were suffering from diarrhoea, and were emaciated. On post mortem examination the posterior half of the duodenal loop was found to be affected with muco-enteritis, the contents being of a whitish mucoid nature. Amongst this material were a large number of minute parasites, apparently a small species of "*Taenia*," also two or three larger cestodes. The intestines of both chickens were congested, but in one they were empty, while in those of the other, the "*Plymouth Rock*," there was a large quantity of the mucoid material present, similar to that noted in the duodenum."

The larger tapeworm here associated with *D. varians* was *D. cesticillus*.

## NEMATODA.

*Heterakis perspicillum* (Rudolphi, 1803), Schneider, 1866.

This was found in the small intestine of 25 per cent. of the fowls examined from Victoria, and then not above 20 to 50 in number. It is also represented in my collection by a few specimens sent by Dr. H. Cumpston, from West Australia. It is already known from New South Wales (Cobb, 1896, p. 747; and 1898, p. 316), and Johnston (1909, p. 412), and "in ovo" (Cobb, 1905, p. 561). Probably also the *Ascaris* sp., reported from New South Wales by Perrie (1892, p. 821), was this species.

*Heterakis papillosa* (Bloch, 1782), Railliet, 1885.

This nematode appears to be common, as is usual in other countries, in the fowls around Melbourne—practically every fowl examined having at least a few of these worms in either small intestine, rectal caeca, or rectum, while in some cases they were very numerous.

This has previously been recorded for Australia by Cobb (1896, p. 748), and Johnston (1909, p. 412), from New South Wales only, though it is probable also that the *Oxyuris* sp. recorded from New South Wales by Perrie (1892, p. 822) was this species.

Aff. *Heterakis maculosa* (Rudolphi, 1802), Schneider, 1886.

Among the specimens of *H. papillosa* taken from the rectum and caeca of a fowl are 3 imperfect male specimens of some form of *Heterakis*, which does not exactly fit into any of the known species of that genus.

The body, which is 12-13 mm. long, is thick and very transparent, sharply tapering anteriorly and only slightly posteriorly. The mouth is surrounded by three very well-marked lips, the superior being slightly the largest, and each lip has a papilla in the centre of its base. No lateral wings are visible on either

head, sides or tail. The tail is truncated obliquely, and has a mucronate tip. It carries, so far as these specimens show, only 3 pairs of post-anal papillae. There are two spicules, short, and not quite equal. The preanal sucker has a strongly developed chitinous ring.

In some points it appears most closely allied to *Heterakis maculosa* of the pigeon and pheasant, but it is smaller, apparently has fewer anal papillae, and has no lateral wings at the anterior end.

The imperfectness of the present material, which I have not been able so far to augment, precludes me from giving a fuller account of this form. *H. maculosa* itself has not, so far as I am aware, been recorded from the fowl.

*Trichosoma retusum*, Raill., 1893.

This form was only found in one case, fairly numerous, in the small intestine of an apparently perfect bird.

The specimens are normal except that the female may reach a length of 30 mm. (as against 19 mm.), and the eggs are 45 to 65  $\mu$  long by 18 to 24  $\mu$  wide (as against 50-55  $\mu$  long by 30 to 32  $\mu$  wide).

This genus has not, so far, been recorded from the fowl in Australia. My specimens are from the neighbourhood of Melbourne.

*Oryspirura parvorum* (sp.n.). (Pls. XXXIII.-XXXV.,  
Figs. 14-21).

The 16 specimens on which this description is based were sent to me from Rockhampton, Queensland, by Dr. S. Dodd, to whom I am also indebted for the accompanying note on their manner of occurrence and effect on the host.

*Description.* The body tapers gradually to each end, the anterior end being bluntly rounded, the tail tapering more sharply. The outer layer of the cuticle has very fine transverse striations, and occasionally faint longitudinal ones also, which are finer than those due to the polynyarian structure of the muscle-layer.

Sometimes, as in four out of seven specimens, the male has swollen cuticular "wings" anteriorly on either side of the head

(see Figs. 16 and 17). They commence at various distances, .034, .06 and .18 mm. from the anterior end, and extend backwards for .09 to .129 mm., attaining a maximum width of .03 mm. They seem to be always uneven, both in their anterior boundary and in length on the two sides. These are presumably comparable with the "voluminous lateral cuticular membranes" given by Ransom as characteristic of *O. anacanthura* (1904, p. 21) and the "bladder-like expansion" of *O. brevisubulata* (Ransom, 1904, p. 23).

In the form now being described, although these structures are not constant in their full development, other male specimens in addition to those mentioned above show a tendency towards the lateral expansion of the cuticle at points varying in position on the head region. When these cephalic wings are largest the body is always constricted in the region over which the "wings" are present (cf. Fig. 16).

The mouth is somewhat oval, and is surrounded by 6 small oral papillae, 4 submedian and 2 lateral, and further back there are also 4 sublateral papillae (Figs. 17 and 18). The 6 oral papillae are extremely difficult to see from any aspect, and in only one of these 16 specimens have I been able to view them all in the one individual, and then only under the most favourable conditions, so that one is inclined to doubt the constant presence of the full number. The 4 sublateral papillae are comparatively large and clear. No regular chitinous ring with clefts, as in *O. mansoni*, is present, although the large anterior opening of the pharynx is sometimes partially closed over by a thin indefinite and irregular cuticular membrane.

The nerve-ring is situated 220 to 300  $\mu$  from the anterior end of the body (see Fig. 15 n.r.). The excretory pore is situated at 360 to 460  $\mu$  from the anterior end (see Fig. 15 e.p.), and near the same transverse plane the small inconspicuous cervical papillae may sometimes be seen. No caudal papillae are present in either sex.

The pharynx (Fig. 17) has a total length of 34 to 50  $\mu$ , generally, however, about 45  $\mu$ . The anterior portion, which, like that of *O. mansoni*, is shorter and wider and more rounded, is 17 to 30  $\mu$  long by 27 to 36  $\mu$  wide, the hinder more cylindrical



part being 17 to 27  $\mu$  long by 17 to 27  $\mu$  wide (except for its posterior end, where it overlaps the oesophagus and reaches a width of 34  $\mu$ ). Though it is not apparent from the range of sizes just given for the pharynx, the hinder part is slightly longer than the front part in 12 out of the 16 specimens. The well-developed cuticular lining of the pharynx is produced at the junction of its anterior and posterior portions so as to project irregularly forwards (cf. *O. mansoni*, Ransom, 1904, p. 15). Sometimes in *O. parvum* (cf. Fig. 18) there is also an inward and anteriorly directed projection from the wall of the anterior portion of the pharynx, which does not appear to be represented in *O. mansoni*. The oesophagus has the club-shape comparable to *O. mansoni*, but is shorter than in that species, never reaching over 1.3 mm. in length, and usually being only about 1.13 mm. long.

*Male*.—9.2 to 14.5 mm. long, by .26 to .33 mm. thick, i.e., rather shorter and thinner than *O. mansoni*. The tail (Fig. 19) is very sharply curved ventrally, much more so than in *O. mansoni*, and ends in a somewhat sharp point, the tip of the tail not being recurved, as in that species. No membranes are present. The cloacal opening is 230 to 300  $\mu$  from the tip of the tail, which is distinctly less than in *O. mansoni*. Five pairs of anal papillae are present, 3 preanal arranged in two lines, slightly diverging from back to front, though not as much so as in *O. mansoni*. Two post-anal pairs are found, one close behind the cloacal opening and one a short distance behind that again. I have not been able to distinguish any other papillae similar to those lying one on either side of the cloaca in *O. mansoni*. There are two spicules, one (Fig. 19, l.s.) long and thin, the other (Fig. 19, s.s.) short, thick, and boat-shaped in its distal portion, which acts as a guide for the longer spicule. The latter is 3.4 to 4.1 mm. long and 11 to 12.7  $\mu$  thick along its length, swelling out to 24 or 30  $\mu$  at its open base. The short spicule is 180 to 210 (in one case 240)  $\mu$  long by a maximum diameter of 27 to 42  $\mu$ . These spicules differ in length and thickness from *O. mansoni*.

*Female*.—13.5 to 20 mm. (generally about 15 mm.) long by .27 to .39 mm. thick, i.e., thinner than *O. mansoni*. The anus (Fig. 20) is 390  $\mu$  to 440 (rarely)  $\mu$ , and vulva .78 to 1.07 mm.



from the tip of the tail, again less than in *O. mansoni*. The uterus and ovary are double, the vagina formed by the union of the two uteri, is about 2.64 mm. long (i.e., more than in *O. mansoni*), but in the middle-third of its length it is generally swollen out into a thinner-walled portion in which 10 or more eggs may lie in one transverse plane (see va., Fig. 20). The posterior end of this swelling is never more than .66 mm. from the vulva, and never more than one egg is found at any point along this terminal portion. This vaginal swelling does not appear to be present in *O. mansoni*. The eggs, too, are smaller than in that species, being 33 to 45  $\mu$  long by 25 to 30  $\mu$  wide, and often retain their square-ended appearance until ready to be laid. Those in the vagina contain fully-formed embryos (Fig. 21). It will be seen from the above that though this species is closely allied to *O. mansoni*, yet it is a distinct form from the latter. A careful comparison of the two sets of measurements will show that while in some cases the range of extremes overlaps, though it is never the same (e.g., the length of the pharynx, the length of the male and female, position of the anus in the female), yet in other features the differences are distinct, as seen in the presence of the cuticular cephalic wings on the male, the shorter oesophagus, the thinner bodies of both male and female, the more posterior position of the cloacal opening in the male, the fewer anal papillae, the greater length and thickness of the long spicule, and in general less length of the short spicule, the usually more posterior position of the anus and vulva, the longer vagina, and the much smaller eggs.

Dr. Dodd writes as follows:—" 'Worm in the eye' in poultry has been known to poultry-keepers in North Queensland for some years. My attention was called to the heavy mortality resulting from this affection early in 1908, but no opportunity for investigating it occurred until late in that year. Then a live fowl was sent from Rockhampton for the purpose of observations in connection with a disease (subsequently ascertained to be *Spirochaetosis*) which was then causing heavy losses. The bird in question was quite lively, but was affected with marked conjunctivitis, accompanied by slight swelling over the

lachrymo-nasal fossae. Occasionally the bird would scratch its eyes with its claws as if to remove some irritant. On closer inspection one could see one or two worms looking like short pieces of white thread wriggle across the cornea at the lower surface, and by pulling back the membrana nictitans a large number of the worms could be seen in active movement. About 60 of them were removed by means of forceps for subsequent examination. The eyes were then well irrigated with a 5 per cent. warm solution of boracic acid. The treatment was repeated on several occasions. All the worms disappeared and the bird made a complete recovery. Since then opportunity has been taken of examining other birds so affected.

The disease is very common at Cairns, North Queensland, and the loss occasioned there is often serious. It has also been observed at other towns in tropical Queensland, and it will be found probably throughout the coastal towns of tropical Australia. It has not been observed away from the sea coast. This feature was pointed out by Ransom in connection with the occurrence of *Oryspirura mansonii* in other countries.

The early symptoms of infestation are not very marked, there being slight lachrymation accompanied by slight conjunctivitis. Apparently the presence of the worms, which can generally be found on pulling down the nictitating membrane, causes more or less irritation according to their number; this irritation is frequently shown by the fowl scratching at the affected eye or eyes. If untreated, a purulent conjunctivitis sets in, probably induced by the efforts of the bird to remove the offending bodies, and pus collects at the inner canthi, which may completely close up the eye. The latter becoming very swollen, a sero-purulent material collects in the lachrymo-nasal fossa, the skin over which becomes more or less distended. In bad cases the cornea becomes implicated, and finally loss of the affected eye results. Birds so affected lose flesh considerably, and may die from exhaustion.

The life-history of the worm being unknown, preventive measures cannot be rationally adopted, especially in cases where fowls are allowed large areas in which to run. The treatment usually applied is to remove as many worms as possible by

means of fine dressing forceps, and then well irrigate the eye with warm boracic lotion, but complete success greatly depends on the extent of the complications. A poultry breeder whose fowls suffer considerably states that he has had great success by dropping a few drops of chloroform into the affected eye and then irrigating it with warm water. Very scant attention to this condition is found in English literature, the chief information being given by Ransom (1904), who also summarises previous reports. Neumann just mentions its existence, but classes it under the *intra-ocular* filariae. In all cases observed by me, the worm is *extra-ocular*, as is *Oxyspirura mansonii*."

For convenience of reference I include a table on the following page, which shows the metazoan parasites recorded to date from *Gallus domesticus* in Australia.



METAZOAN PARASITES (*Continued*).

<i>Heterakis perspicillum</i> (=indexa)	N. S. W.	- Cobb	- Agric. Gaz. N.S.W., vii., 1896, p. 747, and ix., 1898, p. 316.
" "	(in ovo)	- Cobb	- Agric. Gaz. N.S.W., xvi., 1905, p. 561.
" "	-	- Johnston	- Proc. Linn. Soc. N.S.W., 1909, p. 412.
" "	-	- Sweet	- Herein.
<i>Oxyuris parvorum</i> , n. sp.	-	- Sweet	- Herein.
<i>Oxyuris</i> , sp.	-	- Perrie	- Agric. Gaz. N.S.W., iii., 1892, p. 822.
<i>Trichosoma retusum</i>	-	- Sweet	- Herein.

## ARACHNIDA.

<i>Acarus depilis</i>	-	- Brown	- Brit. Med. Jour., 1897, ii., p. 1675.
<i>Argas americanus</i>	-	- Theobald	- Brit. Mus. (Nat. Hist.), 1904, 2nd Report on Economic Zoology, p. 114.
<i>Argas persicus</i>	-	- Froggatt	- Agric. Gaz. N.S.W., July, 1900 (Misc. Publ.)
" "	-	- Sweet	- Antea, p. 16.
<i>Argas victoriensis</i>	-	- Sweet	- Antea, p. 16.
<i>Cyodites nudus</i> , Viz.	-	- Cleland & Johnston	- Proc. Linn. Soc. N.S.W., 1910, p. 28.

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 Johnston: T. Harvey, 1909.—Proc. Linn. Soc. N.S. Wales, 1909.  
 Perrie, 1892.—Agric. Gaz. N.S. Wales, iii., 1892.  
 Ransom: B. H., 1904.—U.S. Department of Agriculture, Bureau of Animal Industry, Bull., 60.  
 Ransom: B. H., 1905.—U.S. Dept. of Agric., Bureau of Animal Industry, Circ. 85.  
 Ransom: B. H., 1909.—Smithsonian Institution, U.S. National Museum, Bull. 69.

## EXPLANATION OF PLATES.

All figures drawn by aid of camera lucida.

Figs. 1-13.—*DAVAINEA VARIANS*, sp. n.

- Fig. 1 —Head, showing rostellum and suckers with hooks.  
 $\times$  about 230.  
 2a—Rostellar hooks; upper figure in face view, lower figure  
 in side view  $\times$  almost 1600.  
 2b—Acetabular hooks.  $\times$  about 1600.  
 3-7—Showing variations in configuration of strobila. Nos.  
 3-6  $\times$  about 30, No. 7  $\times$  40.  
 8—3 segments (apparently 3rd, 4th and 5th), showing  
 alternate genital pores and eversion of cirrus back  
 to last segment.  $\times$  about 30.  
 9—Cirrus half everted, showing spines.  $\times$  175.  
 10—Cirrus fully everted.  $\times$  175.  
 11—Two eggs in capsule.  $\times$  about 380.  
 12—One single egg.  $\times$  about 380.  
 13—Diagram illustrating usual proportionate development  
 of male and female organs in different segments:  
 Testis (t.), cirrus sac (c. s.), cirrus (c.), ovary (o.),  
 vagina (v.), vitelline gland (v. g.), receptaculum  
 seminis (r.), eggs in capsules (e.).

Figs. 14-21.—*OXYSPIRURA PARVOVUM*, sp. n.

Fig. 14—Male and female worms.  $\times 1\frac{1}{3}$ .

15—Head and anterior part of body of female worms, showing position of pharynx (ph.), nerve-ring (n. r.), excretory pore (e. p.), oesophagus (oes.), intestine (int.), and lateral line (l. l.).  $\times$  about 60.

16—Outline of head of male, showing oral papillae from ventral surface.  $\times 40$ .

17—Head of male, showing oral papillae from ventral surface.  $\times$  about 120.

18—Head, showing structure of pharynx in lateral view.  $\times$  about 380.

19—Tail of male worm, showing long (l. s.) and short (s. s.) spicules, 5 pairs of anal papillae (a. p.), intestine (int.), ductus ejaculatorius (d. e.), and position of cloacal opening (c. o.).  $\times$  about 60.

20—Tail of female worm, showing position of vulva (v.), anus (a.), ovary (o.), vagina (va.), and intestine (int.).  $\times 80$ .

21—Three eggs, showing enclosed embryo.  $\times 220$ .

END OF VOLUME XXIII., PART I.

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